

AMENDMENT TO THE CLAIMS

1. (Currently amended) A method for producing a semiconductor device, comprising the steps of:

forming a first conductive film as a seed layer having non epitaxial crystal structure on a barrier film having a crystal structure;

forming a second conductive film which is made of the same material as the first conductive film on the first conductive film; and

heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film.

2. (Original) The method of claim 1, wherein each of the first conductive film and the second conductive film is formed of copper or a metal mainly containing copper.

3. (Original) The method of claim 1, wherein the resistivity of the third conductive film is equal to or smaller than $1.9 \mu\Omega\cdot\text{cm}$.

4. (Original) The method of claim 1, wherein the resistivity of a layered film including the first conductive film and the second conductive film before the integration of the first and second conductive films is equal to or greater than $2.2 \mu\Omega\cdot\text{cm}$.

5. (Previously presented) The method of claim 1, wherein the step of forming the first conductive film is performed at a temperature which is equal to or lower than a $1/3$ of the absolute temperature of the melting point of the first conductive film.

6. (Original) The method of claim 1, wherein the step of heating the first conductive film and the second conductive film is performed at a temperature which is equal to or lower than a 1/2 of the absolute temperature of the melting point of the third conductive film.

7. (Original) The method of claim 1, wherein the barrier film is a tantalum film or tantalum alloy film.

8. (Original) The method of claim 7, wherein the crystal structure of the tantalum film or tantalum alloy film is a β -structure.

9. (Previously presented) The method of claim 1, wherein the step of forming the first conductive film includes the step of forming the first conductive film by a physical vapor deposition method or a chemical vapor deposition method.

10. (Original) The method of claim 1, wherein the step of forming the second conductive film includes the step of forming the second conductive film by a chemical vapor deposition method or a plating method.

11. (Original) The method of claim 1, wherein the step of heating the first conductive film and the second conductive film is performed at a temperature equal to or lower than 200°C.

12. (Previously presented) The method of claim 1, wherein:

the barrier film is formed on a wall of a concaved portion provided in an insulating film;
the step of forming the first conductive film includes the step of forming the first conductive film on the barrier film in the concaved portion such that the concaved portion is filled to an intermediate depth thereof;

the step of forming the second conductive film includes the step of forming the second conductive film on the first conductive film in the concaved portion such that the concaved portion is completely filled; and

the method further includes, after the step of heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film, the step of removing a portion of the third conductive film which extends out of the concaved portion, thereby forming a wire in the concaved portion.

13. (Currently amended) A method for producing a semiconductor device, comprising the steps of:

forming a first conductive film as a seed layer having non epitaxial crystal structure on a barrier film having a crystal structure;

forming a second conductive film which is made of the same material as the first conductive film on the first conductive film; and

heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film,

wherein the thickness of the first conductive film is set to be equal to or smaller than a 1/4 of the total thickness of the first conductive film and the second conductive film.

14. (Original) The method of claim 13, wherein the resistivity of a layered film including the first conductive film and the second conductive film before the integration of the first and second conductive films is equal to or greater than $2.2 \mu\Omega\cdot\text{cm}$.

15. (Previously presented) The method of claim 13, wherein the step of forming the first conductive film is performed at a temperature which is equal to or lower than a $1/3$ of the absolute temperature of the melting point of the first conductive film.

16. (Previously presented) The method of claim 13, wherein:
the barrier film is formed on a wall of a concaved portion provided in an insulating film;
the step of forming the first conductive film includes the step of forming the first conductive film on the barrier film in the concaved portion such that the concaved portion is filled to an intermediate depth thereof;

the step of forming the second conductive film includes the step of forming the second conductive film on the first conductive film in the concaved portion such that the concaved portion is completely filled; and

the method further includes, after the step of heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film, the step of removing a portion of the third conductive film which extends out of the concaved portion, thereby forming a wire in the concaved portion.

17. (Currently amended) A method for producing a semiconductor device, comprising the steps of:

forming a first conductive film as a seed layer having non epitaxial crystal structure on a barrier film having a crystal structure;

forming a second conductive film which is made of the same material as the first conductive film on the first conductive film; and

heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film,

wherein the thickness of the first conductive film is set to be equal to or smaller than 120 nm.

18. (Original) The method of claim 17, wherein the resistivity of a layered film including the first conductive film and the second conductive film before the integration of the first and second conductive films is equal to or greater than $2.2 \mu\Omega\cdot\text{cm}$.

19. (Previously presented) The method of claim 17, wherein the step of forming the first conductive film is performed at a temperature which is equal to or lower than a $1/3$ of the absolute temperature of the melting point of the first conductive film.

20. (Previously presented) The method of claim 17, wherein:
the barrier film is formed on a wall of a concaved portion provided in an insulating film;
the step of forming the first conductive film includes the step of forming the first conductive film on the barrier film in the concaved portion such that the concaved portion is

filled to an intermediate depth thereof;

the step of forming the second conductive film includes the step of forming the second conductive film on the first conductive film in the concaved portion such that the concaved portion is completely filled; and

the method further includes, after the step of heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film, the step of removing a portion of the third conductive film which extends out of the concaved portion, thereby forming a wire in the concaved portion.

21. (Previously presented) The method of claim 1, wherein the first conductive film has an amorphous structure.

22. (Previously presented) The method of claim 13, wherein the first conductive film has an amorphous structure.

23. (Previously presented) The method of claim 17, wherein the first conductive film has an amorphous structure.

24. (Currently amended) A method for producing a semiconductor device, comprising the steps of:

forming a first conductive film as a seed layer having a relatively amorphous structure on a barrier film having a crystal structure;

forming a second conductive film which is made of the same material as the first

conductive film on the first conductive film; and

heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film.

25. (Previously presented) The method of claim 24, wherein each of the first conductive film and the second conductive film is formed of copper or a metal mainly containing copper.

26. (Previously presented) The method of claim 24, wherein the resistivity of the third conductive film is equal to or smaller than $1.9 \mu\Omega\cdot\text{cm}$.

27. (Previously presented) The method of claim 24, wherein the resistivity of a layered film including the first conductive film and the second conductive film before the integration of the first and second conductive films is equal to or greater than $2.2 \mu\Omega\cdot\text{cm}$.

28. (Previously presented) The method of claim 24, wherein the step of forming the first conductive film is performed at a temperature which is equal to or lower than a $1/3$ of the absolute temperature of the melting point of the first conductive film.

29. (Previously presented) The method of claim 24, wherein the step of heating the first conductive film and the second conductive film is performed at a temperature which is equal to or lower than a $1/2$ of the absolute temperature of the melting point of the third conductive film.

30. (Previously presented) The method of claim 24, wherein the barrier film is a tantalum film or tantalum alloy film.

31. (Previously presented) The method of claim 30, wherein the crystal structure of the tantalum film or tantalum alloy film is a β -structure.

32. (Previously presented) The method of claim 24, wherein the step of forming the first conductive film includes the step of forming the first conductive film by a physical vapor deposition method or a chemical vapor deposition method.

33. (Previously presented) The method of claim 24, wherein the step of forming the second conductive film includes the step of forming the second conductive film by a chemical vapor deposition method or a plating method.

34. (Previously presented) The method of claim 24, wherein the step of heating the first conductive film and the second conductive film is performed at a temperature equal to or lower than 200°C.

35. (Previously presented) The method of claim 24, wherein:
the barrier film is formed on a wall of a concaved portion provided in an insulating film;
the step of forming the first conductive film includes the step of forming the first conductive film on the barrier film in the concaved portion such that the concaved portion is filled to an intermediate depth thereof;

the step of forming the second conductive film includes the step of forming the second conductive film on the first conductive film in the concaved portion such that the concaved portion is completely filled; and

the method further includes, after the step of heating the first conductive film and the second conductive film such that the first and second conductive films are integrated to form a third conductive film, the step of removing a portion of the third conductive film which extends out of the concaved portion, thereby forming a wire in the concaved portion.